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Abstract Title	Efficient proton and ion generation beyond 100MeV/nucleon by laser excitation of nanofoils
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Abstract	Here, we discuss new acceleration mechanisms experimentally only accessible with relativistic laser intensities beyond 10^20 W/cm^2. These mechanisms promise much higher proton and ion energies exceeding 100MeV/nucleon. However, they also have much more demanding requirements for the laser parameters, like ultrahigh contrast and flat top focusing.

Summary

In the past 10 years laser-driven acceleration of protons and ions has been of particular interest for fundamental as well as applied sciences. With intensities on the order of 10^18 to 10^19 W/cm^2, ion acceleration is typically achieved by laser light interacting with micrometer scaled solid matter targets in the TNSA regime, favoring acceleration of protons to energies of up to ~60MeV [1] and only generating ion beams (Z>1) below 10MeV/nucleon [2]. This mechanism seems to have stagnated in terms of particle energy as well as conversion efficiency and control of spectral shape, remaining too low for most advanced applications; for instance, ion fast ignition [3] or hadron cancer therapy [4] can have demands for energies well in excess of 100MeV/nucleon. Here, we want to discuss ways to overcome these limitations. With continuing progress on laser technologies ultra-high contrast and relativistic intensities (>10^20 W/cm^2) are more and more available allowing to experimentally access new acceleration mechanisms. Radiation pressure acceleration (RPA) [6, 7] and Break-Out Afterburner (BOA) [8] have been discovered in numerical experiments using PIC-codes on massively parallel supercomputers. These mechanisms efficiently transfer laser energy to all target ions, and promise much higher proton and ion energies making them a promising and competitive alternative to conventional accelerators. However, they also have much more demanding requirements for the laser parameters, like ultrahigh contrast laser pulses (RPA, BOA), flat top focusing (RPA) and high laser intensities (>5x10^19 for BOA, >1x10^22 for light sail RPA). In this regard we also present data from the Trident laser facility, where proton and ion energies exceeding 100MeV/nucleon have been demonstrated with the BOA mechanism.

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Abstract Title	**Study of beam-induced plasma dynamics in hydrogen gas filled RF cavity for a Muon Collider**
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Abstract	The influence of an intense beam in a high-pressure gas filled RF cavity has been studied by using a 400 MeV proton beam in the Mucool Test Area at Fermilab. The beam-induced plasma dynamics was observed in various conditions. The result and analysis will be shown in this presentation.
Summary	
The beam-induced plasma dynamics in a high-pressure gas filled RF cavity has been observed with various peak RF field gradients, gas pressures, beam intensities and gas species. The experimental results can be well explained by a simple current conductance model in a matter. The ionized electrons suck a large amount of RF power from the cavity and gain their energies. Since about 2000 electron-ion pairs are generated by an incident charged particle, the beam-induced plasma heavily loads the RF cavity. By adding a small amount of electronegative gas in the cavity, the ionized electron can be removed. As a result, the observed RF power dissipation became significantly low. Small amount of RF power loss was still observed in the cavity. From detail analysis, a residual positive charged particle in the cavity consumes a small amount of RF power. Amount of RF power dissipation is estimated in the real muon acceleration application by using this analysis model and found that the beam-induced plasma loading looks to be manageable.	

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Abstract Title	Overview of Phase Space Manipulations of Relativistic Electron Beams
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Abstract	This talk will review recent advances in beam phase space manipulations.

Summary

The ability to tailor a beam's 6-D phase space is critical to meet the demands of various applications. For instance, imprinting a spatial chirp in beam with crab cavities can improve the luminosity of colliders; in emittance compensation, a solenoid is used to align the transverse phase ellipses of each beam slices to the same slope so that the projected emittance is minimized; in beam conditioning, particles with large betatron amplitudes are given extra energy to compensate for the path length differences from betatron oscillation, which may greatly enhance the gain in FELs; in wake field acceleration, electron beam with a linearly ramped current profile can increase the transformer ratio. In this talk, the beam manipulation techniques will be classified into 3 categories: 1-D manipulation, 2-D manipulation and fully 3-D manipulation. 1-D manipulation includes bunch compression, bunch decompression, longitudinal-to-energy mapping, parallel-to-point imaging, etc. 2-D manipulation includes flat-beam generation, measuring bunch length with a transverse cavity, emittance exchange and phase space exchange, etc. 3-D manipulation includes beam conditioning and emittance partitioning. In particular, this talk will focus on several techniques that can potentially improve the performance of LPWA, PWFA and FELs driven by them.